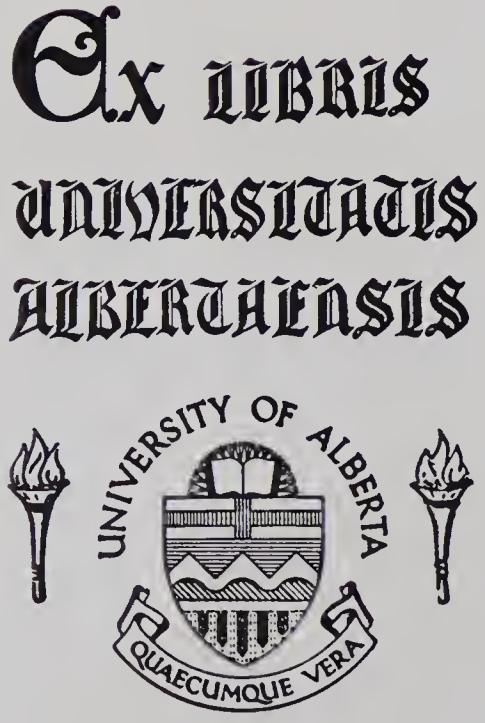

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A COMPARISON OF SOCIAL AND NONSOCIAL COMPETITION

by

James Frederick Evans

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

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UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Comparison of Social and Nonsocial Competition", submitted by James Frederick Evans in partial fulfilment of the requirements for the degree of Master of Arts.

Abstract

The purposes of this thesis were to explore a proposed difference between social and nonsocial competition and to investigate possible relationships between performance, the level of motivation and cognitive activity. Ss performed a reaction time task under one of three conditions, (1) a reaction time task alone, (2) in competition with an instrument, or (3) in competition with another person. Heart rate was used as a measure of activation to detect motivational differences. Ratings of alertness and interest were used to espy cognitive activity.

Minimal evidence of a difference between social and nonsocial competition was found. No information was obtained regarding the possible relationships between performance, the level of motivation and cognitive activity. Possible reasons for the lack of significant findings were discussed.

Acknowledgements

I would like to express my sincere appreciation and thank Dr. Brendan G. Rule for her assistance and guidance during the production of this thesis. I also extend thanks to Dr. W. A. Blanchard, Dr. R. E. Walley, and Dr. R. B. Alderman for their helpful suggestions.

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Introduction

The intricate nature of competition has been an area of investigation for social psychologists for many years. In fact, the effect of a competitive situation on performance was the first social variable to be investigated objectively in a laboratory (Allport, 1954). Competitive situations, as they have been defined, are situations in which an individual's success is determined by some characteristic of his response relative to that of another individual or other individuals. In many studies competition is an all-or-none situation. One person or group wins and the other person or group loses. In other competitive situations such as the Prisoner's Dilemma game, the situation is not as limpid; instead different probabilities are involved (Wilson and Bixenstine, 1962). Besides completely winning or losing, a person may partially win and partially lose to varying degrees. In this thesis competition refers to the former, the all-or-none situation.

Under competitive conditions performance may improve, degenerate, or be unaffected (Triplett, 1897). It has been suggested, depending on individual differences, the intensity of competition, and the complexity of the task, that people are beneficially, adversely, or not affected by competition (McKee and Leader, 1955; Morgar, 1962; Triplett, 1897; Wickens, 1942). In much of the empirical work that has been done in this area, competition has on the average, improved performance (Church, 1962; Hurlock, 1927; Triplett, 1897). Early

theorizing about the beneficial effects of competition can be encapsuled under what is known as "social-facilitation". Allport (1924) described social facilitation and an additional component, rivalry. He was the first to make the distinction between the two motivational factors involved in competition. He made the distinction as follows:

> In all kinds of competitive performance we may recognize two social factors. The first is social facilitation, which consists of an increase of response merely from the sight or sound of others making the same movements. The second is rivalry, an emotional reinforcement of movement accompanied by the consciousness of a desire to win. Although the effects of the two are difficult to distinguish, they are in reality distinct factors in the total response.
>
> (Allport, 1924, p. 262).

The proposal that two distinct motivational factors are involved in competition has not been validated nor disproved. The conceptual distinction seems to have been relatively ignored and empirical work (Blake and Mouton, 1962a; Church, 1962; Deutsch, 1960; Myers, 1961; Sims, 1928) has focused on the effects of competition. Whether competition is referring to just rivalry or rivalry and social facilitation is ambiguous. In this thesis the author has tentatively accepted the proposal that when people are competing in the presence of one another, the motivational aspect of competition consists of the two separate factors, rivalry and social facilitation.

Although it has been assumed that competitive situations involve motivational and cognitive components, minimal evidence of

this is available. Furthermore, the relationships among performance, the level of motivation and cognitive activity, are ambiguous. Church (1962) studied the effect of competition on reaction time. His task involved pulling a toggle switch as fast as possible after the onset of a light. He found that competition decreased reaction time (RT). He also found that competition resulted in increases in the level of palmar skin conductance and self rated alertness. No evidence for a causal relationship between improved performance and increased palmar skin conductance, or self rated alertness was found. Whether or not there was a relationship between skin conductance and self rated alertness was not mentioned. No definite conclusions can be made on the basis of this study which used only one task, and one measure of activation. Elliot (1965), after working with RT and heart rate (HR) as functions of the magnitude of an incentive and probability of a success, suggested that it may be unwise to describe any general relation between activation and performance. This suggestion was based on data collected from only three Ss. Obviously, questions about the relationships remain.

The terms "activation", "arousal", "energy mobilization" and "excitation" are often used synonymously. This thesis uses the term activation. Duffy (1962) defines activation as follows:

> The level of activation of the organism may be defined, then, as the extent of release of potential energy stored in the tissues of the organism, as this is shown in activity or response.
>
> (Duffy, 1962, p. 17)

With regard to motivation Duffy (1962) says the following:

> If it is desired to measure the intensity (as opposed to the direction) of the motivation, measurement should be made of the physiological processes indicative of the level of activation. When variables other than the incentive-value or the threat-value of a situation are controlled, measurement of the degree of activation should afford the basic means of measuring the intensity of "motives".
>
> (Duffy, 1962, p. 10).

On basis of the above and other studies (Blatt, 1961; Malmo, 1959; Schnore, 1959) HR was used as a measure of activation in order to detect the intensity of motivation.

Measuring cognitive activity is a very ambiguous and undefined task. Assuming that alertness taps some aspect of cognitive activity related to attention, Church (1962) used ratings of alertness. In this study ratings of alertness and interest were used. Ratings of interest were used exploratively to see if this might be a sensitive and pertinent index of cognitive activity.

Still prevalent (Deutsch and Krauss, 1965) is the controversy over whether social situations are different from nonsocial situations. Pertinent to this controversy is the question about whether there is a difference between social and nonsocial competitive conditions. All research to date in this area has involved social competition, i.e., competition with another person or persons in one manner or another. However, some psychologists have suggested that all principles of psychological functioning can be discovered in the nonsocial setting. Hull (1943) held that social and moral data

can be derived from a knowledge of basic learning principles. Skinner (1953) said, in referring to the study of people in groups, "whether the basic data are fundamentally different is still a question." With regard to competition, he said, "Catching a rabbit before it runs away is not very different from catching it before someone else does." The present author does not agree with this position, but rather holds that social situations are different from nonsocial situations. Asch (1959) elaborates this point of view in the following way:

> Social psychology is not an applied discipline. Its task is to contribute to a theory of the psychological functions. This cannot be accomplished only by studying individuals in exclusively individual settings; it requires also the direct investigation of happenings between persons, or the extension of observation beyond the limits that experimental psychology had traditionally imposed. We cannot have a tenable theory of emotions or motives if we do not study those that refer directly to persons; no procedure of extrapolation will suffice for this purpose.
>
> (Asch, 1959, p. 366).

Whether or not social situations are different from nonsocial situations has far reaching implications, both theoretically and methodologically, in the area of competition. Besides affecting performance, competition has also been shown to affect people in other ways. Deutsch (1960) found that a competitive orientation lead to suspicious and untrustworthy behavior. Blake and Mouton (1962a) found that under competitive intergroup conditions, group members were relatively blind to points of communality between their own and contending proposals. They also found (Blake and

Mouton, 1962b) that group members evaluated their own group product above the judgments they accorded to the proposal from a competitive group. If competing with an inhuman object is the same as competing with a human, it would seem to imply that the causes for the changes in behavior, because of competition, are more within the competitors and have little to do with whom or what a person is competing against.

In addition, if competing against an inhuman object is psychologically identical to competing with a human, research on the effects of competition can be accomplished by having Ss compete with instruments rather than human Ss. This would reduce the recruitment of Ss problem and wins and losses could be more easily controlled.

As evidenced above, even though research in the area of competition has been plentiful, it has not been systematic and very basic issues remain to be clarified. One purpose of the present study was to compare the effects of social and nonsocial competition on performance. Another purpose of the study was to investigate the relationship between performance, motivation, and cognitive activity, under conditions of competition and noncompetition.

Social competition was compared with nonsocial competition by having Ss perform a RT task in one of three different situations. One group of Ss completed the task alone, another group competed against an instrument and a third group competed against other people. HR was used to measure the intensity of motivation. Rating

scales of alertness (A) and interest (I) were used to espy cognitive activity. It was predicted that increases in motivation would be reflected behaviorally by a reduction in average RTs proceeding from no competition, through nonsocial competition, to social competition. It was also predicted that the increases in motivation, proceeding through the three conditions in the same order as above, would be evidenced by increasing HRs, and increasing ratings of A and ratings of I.

Method

The Design

The design was a randomized groups design with three groups of twenty Ss each. Different Ss were used in different conditions to eliminate carry over effects. One group of Ss completed the task alone, another group competed against an instrument, and the third group competed against other people. The three groups of Ss were considered as having no competition (N-C), nonsocial competition (NS-C) and social competition (S-C) respectively.

Subjects

Ss were 60 right handed males, 18 to 20 years of age, enrolled in the Introductory Psychology course at the University of Alberta, Edmonton. Ss earned one credit for participating in the experiment. Students in the course who earned six credits for experiment participation received 5% toward their final grade for the course. Booklets were circulated in lecture and tutorial classes so that Ss could sign up for various designated times. Ss were signed up one at a time for the N-C and NS-C conditions and two at a time for the S-C condition. The requirement that Ss had to be male, right handed and between the ages of 18 to 20 inclusive, was stated on the front of the sign-up booklets. Ss were asked whether they were 18 to 20 years of age and right handed when they arrived for the experiment.

Apparatus and Materials

The study was run in a suite of rooms separated by a one way mirror. The Ss were in one room and E and the recording equipment were in the other. The Ss faced the one way mirror through which E could observe them. There was a buzzer system to enable E to give the Ss a ready signal and also to inform the Ss in the competitive situations as to who had won. One buzz was the ready signal. The wins and losses were revealed via the code presented in Appendix D.

Ss sat at a table on which two RT apparatuses were placed. There was a panel between the two apparatuses, but Ss had a partial view of the other side of the panel by means of the reflection in the one-way mirror. Each RT apparatus consisted of a light (GE-NE-40) approximately level with and two feet from the S's eyes, and a telegraph key accessible to the S's right hand. Even though the RT apparatus was duplicated for the S's room, E recorded the times for only one of the Ss. This was necessary to enable E to keep wins and losses equal and in order for all groups. The lights for both Ss were on the 110 volt circuit which was opened and closed with E's switch. The critical S's key was in series with E's switch and a Hunter Model 120 A Klockcounter. When the critical S's key and E's switch were closed, the counter operated until the circuit was broken. E's switch was a double poled switch which when closed, closed both the aforementioned circuits. After the 'ready' buzz, S kept the key depressed (closed) until he saw the light onset, which was the

stimulus to release the key. Releasing the key reopened the timer circuit, which E's switch had closed, and stopped the klockcounter. E switched off his switch to shut off the Ss' lights as soon as the Ss had reacted. The klockcounter recorded RTs accurate to one-thousandth of a second.

HR was measured by means of a Beckman-Offner Type R dynograph. Beckman Biopotential skin electrodes were attached to the Ss using Beckman-Offner adhesive collars and Beckman-Offner paste. One electrode was placed midway up, on each side of S's chest and a ground electrode was placed above his stomach. The dynograph was also equipped with a marker pen with which E marked on the HR record, the end of every tenth RT trial. The recording paper moved at 150 millimeters per minute.

For the NS-C condition there was an instrument, ostensibly designed to perform the same as a human S. This instrument was connected to the nonfunctional RT apparatus (Fig. 1). Ss were informed that the instrument broke the circuit at various speeds after the light came on, and Ss were told to try to beat the instrument. The instrument had a small nonfunctional electrical motor which could be heard rotating. The instrument was "switched on" during the experiment for all groups. For the N-C and S-C conditions the instrument was not connected to the RT apparatus. It was sitting behind the Ss and they were told it was switched on merely to mask out the noise from outside the experimental room.

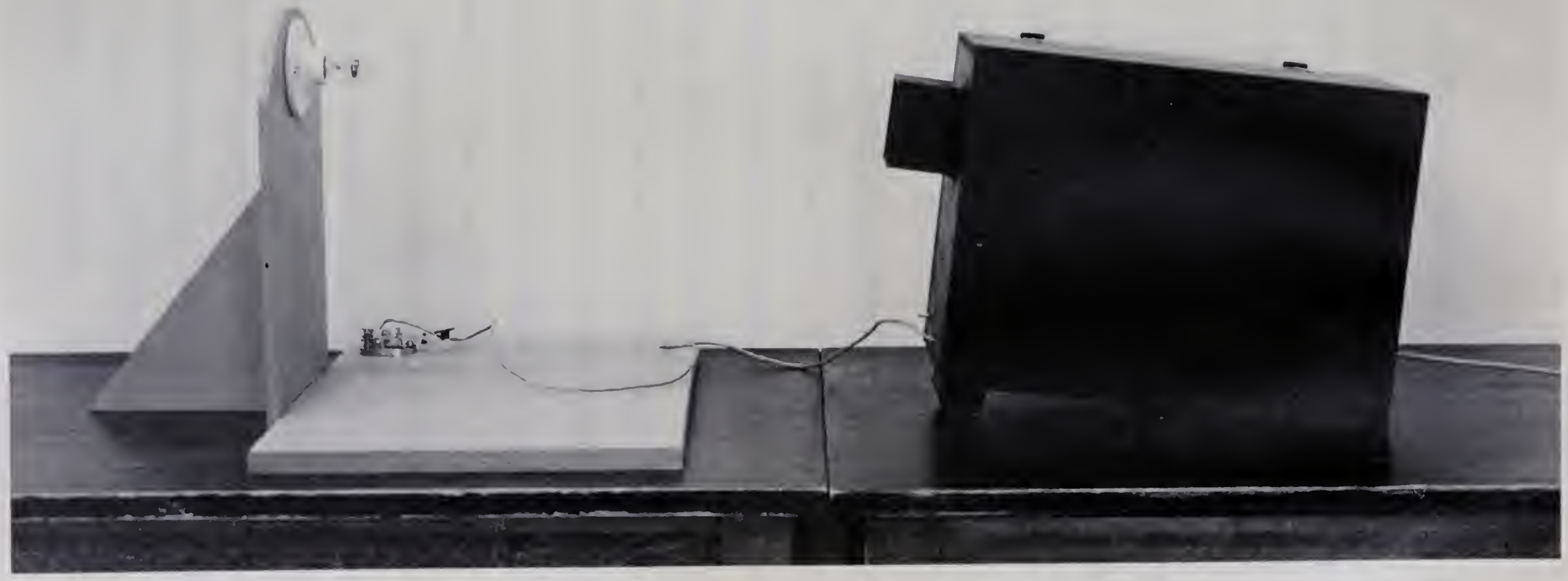

Fig. 1. The instrument, on the right, which was ostensibly designed to perform the same as a human subject. The instrument is connected to the RT apparatus.

There were two rating scales, one for alertness and one for interest. The scales ranged from 1 to 7. The end points of 1 and 7 were labelled weak and strong respectively and the middle point 4 was labelled moderate. Appendix A contains these rating scales.

There was also a questionnaire which was given to the Ss in the NS-C condition regarding the validity of the instrument. Appendix B contains this questionnaire.

Procedure

Ss came to the experimental room and were instructed to sit in front of the RT apparatus. For the N-C and NS-C conditions, Ss were instructed to sit at the apparatus that was functional. For the S-C condition, Ss were instructed to sit down. Since the functional RT apparatus was furthest from the door the first S to enter the room sat at it. Ss in the S-C group chose their own position, so which S was at the functional apparatus and which was at the other apparatus was merely a chance occurrence.

After the S or Ss were in their seats, E explained that HR was going to be recorded during the experiment and that the electrodes would be placed on their chests. Ss were asked if they would mind opening their shirts. After the electrodes were secured the appropriate instructions were read. Appendix C contains the three sets of instructions for the three different groups. E then went into the other room and started the dynograph. After instructions the Ss sat and relaxed

for three minutes. Ten practice trials then commenced during which all groups were given the ready signal, the light was put on and the Ss reacted. After the practice trials E went back into the Ss' room and made sure they understood what they were supposed to do. The experiment then continued with fifty RT trials. During the actual experiment, the sequence of trials was identical with the practice session for the N-C condition. For the NS-C and S-C conditions E announced the winner by means of the buzzer system, after each trial. Appendix D contains the signal code. E watched a GraLab Universal Timer to time the foreperiod (period between ready signal and onset of stimulus) according to a predetermined random order of three, five, or seven second intervals. The sequence of wins and losses was predetermined and identical for all critical Ss. Appendix D presents the recording sheet with the sequence of foreperiods and prefabricated wins and losses.

Ss in the S-C condition were told, before the experiment, that if it sounded as if they won and they did not, or vice versa, it was because the two reaction time apparatuses were independent and even though E attempted to switch the lights on together, they did not always come on at the identical same time. Therefore, one or the other may have his trial a few seconds prior to or later than his partner. About four or five times out of 3,000 RT trials a critical S was daydreaming or caught off guard. E then reran the trial. Whenever a premature reaction was made by a critical S, the timer would not start when E closed his switch (because the circuit was open at S's switch) so these trials were rerun also.

After every tenth RT trial E pushed the switch which made a mark on the HR recording sheet to identify sections.

After the fifty RT trials were over, a signal for a relaxation period was given. Ss sat and relaxed for three minutes. On the completion of the three minute rest period E shut off the dynograph and entered the S's room.

Ss in all conditions were asked to rate their level of A and I. Ss in the NS-C condition were asked to fill out the questionnaire regarding the instrument, to check for any suspiciousness about its validity. E also checked with Ss in a non-revealing manner to see if they suspected anything about the other deceptions involved in the experiment. Ss were then thanked and given a credit card. Questions about the experiment and the apparatus were all answered in an explanatory manner but in one which did not reveal the deceptions involved. This was done to eliminate any possibility of Ss knowing about the deception before being in the experiment. Since no anxiety arousing or confidence shaking events had occurred, Ss were never told about the deception.

Results

The dependent variables in this experiment were reaction time, heart rate, and ratings of alertness and interest. Reaction time (RT) was used to measure performance. Heart rate (HR) was used to detect the level of motivation. Ratings of alertness (A) and interest (I) were used to assess cognitive activity. RT was expected to decrease sequentially for the no competition (N-C), nonsocial competition (NS-C) and social competition (S-C) conditions. HR, A and I were expected to increase in the same order.

Reaction Time

RT scores consisted of the average RT for each S averaged over the fifty RT trials. The mean RT for the N-C, NS-C and S-C conditions was .244, .235 and .249 seconds respectively. An analysis of variance did not yield any significant differences between conditions. Table 1 contains a summary of the analysis of variance.

Table 1

Summary of Analysis of Variance of Reaction Time Scores

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	.002	2	.001	1.00
Within Groups	.043	57	.001	

Heart Rate

HR was counted for the last minute of the initial rest period, the first minute of the experimental RT trials, a minute during the middle of the trials (approximately thirty seconds on each side of the twenty-fifth RT trial) and for the last minute of RT trials. HR was also counted for the three minute rest period after the RT trials had terminated. HR scores consisted of HR during the last minute of the initial rest period, average HR during the RT trials and average HR during the terminal rest period.

The mean HR during the initial rest period for the N-C, NS-C and S-C conditions was 86.60, 77.75 and 77.10 beats per minute respectively. An analysis of variance yielded significant differences ($F = 3.26$, df 2/57, $p < .05$). Table 2 contains a summary of the analysis of variance.

Table 2

Summary of Analysis of Variance of Heart Rate Scores During the Initial Rest Period

Source of Variance	Sum of Squares	df	Mean Square	F
Between Groups	1126.7	2	563.35	3.26*
Within Groups	9858.3	57	172.95	

*$p < .05$

Duncan's Multiple Range test (Edwards, 1960) showed that the N-C mean differed significantly ($p < .05$) from the other two means. The NS-C and S-C means did not differ significantly from one another.

The mean HR during the RT trials, for the N-C, NS-C and S-C conditions was 80.07, 75.05 and 77.30 beats per minute respectively. An analysis of variance did not yield any significant differences between these conditions. Table 3 contains a summary of the analysis of variance.

Table 3

Summary of Analysis of Variance of Heart Rate Scores During the Reaction Time Trials

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	252.64	2	126.32	--
Within Groups	7607.52	57	133.47	

In an attempt to reduce within group variance, each S's HR during the last minute of the initial rest period, which from hereon will be referred to as the pretest level (PTL), was subtracted from each of his measured minutes of HR during the session. The average HRs-PTLs were computed. The resultant means for the N-C, NS-C and S-C conditions were -6.53, -2.70 and .20 respectively. An anlysis

of variance yielded significant differences ($F = 6.22$, df 2/57, $p < .01$). Table 4 contains a summary of the analysis of variance.

Table 4

Summary of Analysis of Variance of Heart Rate minus the Pretest Level Scores, during the Reaction Time Trials

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	456.16	2	228.08	6.22*
Within Groups	2089.11	57	36.65	

*$p < .01$

Duncan's Multiple Range test yielded significant differences between the S-C mean and the N-C mean ($p < .01$) and also between the NS-C mean and the N-C mean ($p < .05$). There was no significant difference between the NS-C and S-C means.

The mean HR during the terminal rest period, for the N-C, NS-C and S-C conditions was 80.68, 74.75 and 76.92 beats per minute, respectively. An analysis of variance did not yield any significant differences between conditions. Table 5 contains a summary of the analysis of variance.

Table 5

Summary of Analysis of Variance of Heart Rate Scores after the Reaction Time Trials

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	360.54	2	180.27	1.41
Within Groups	7290.72	57	127.91	

Again, in an attempt to reduce within group variance, the PTL for each S was subtracted from each minute of HR during the terminal three minute rest period. Average HRs-PTLs were computed. The resultant mean for the N-C, NS-C and S-C conditions was -5.92, -3.00 and -.18. An analysis of variance did not yield any significant differences between conditions. Table 6 contains a summary of the analysis of variance.

Table 6

Summary of Analysis of Variance of Heart Rate minus the Pretest Level Scores, after the Reaction Time Trials

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	328.76	2	164.38	2.33
Within Groups	4020.55	57	70.54	

Ratings of Alertness

The mean rating of A for the N-C, NS-C and S-C conditions was 4.55, 4.95 and 4.65 units respectively. An analysis of variance did not yield any significant differences between conditions. Table 7 contains a summary of the analysis of variance.

Table 7

Summary of Analysis of Variance of Ratings of Alertness

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	1.73	2	.87	--
Within Groups	64.45	57	1.13	

Ratings of Interest

The mean rating of I for the N-C, NS-C and S-C conditions was 4.30, 5.70 and 5.00 units respectively. An analysis of variance showed these differences significant at less than the .01 level ($F = 8.67$, df 2/57). Table 8 contains a summary of the analysis of variance.

Duncan's Multiple Range test showed all means to be significantly different from one another ($p < .05$).

Table 8

Summary of Analysis of Variance of Ratings of Interest

Source of Variation	Sum of Squares	df	Mean Squares	F
Between Groups	19.60	2	9.80	8.67*
Within Groups	64.40	57	1.13	

*$p < .01$

In an attempt to uncover information regarding the relationships between performance, indices of motivation, and cognitive activity, the intercorrelations between RT, PTL, HR during RT trials, HR after RT trials and ratings of A and I were computed for each condition. The same correlations were computed using HRs-PTLs instead of HRs. Tables 9 and 10 present these correlations. The correlation coefficients that are significantly different from zero are indicated in the tables. The correlations that were significant were not considered theoretically important.

The qualitative data did not reveal any suspicions, on the part of the Ss, about any of the deceptions involved in this study.

Table 9

Intercorrelations Using Heart Rate Scores

N-C Condition

	1	2	3	4	5
1					
2	-.15				
3	-.24	.79**			
4	-.25	.56**	.89**		
5	.14	-.17	-.19	-.19	
6	-.20	-.32	-.43	-.33	.57*

NS-C Condition

	1	2	3	4	5
1					
2	.03				
3	-.01	.95**			
4	.07	.87**	.93**		
5	.05	-.36	-.43	-.49	
6	-.15	-.40	-.46	-.56	.28

S-C Condition

	1	2	3	4	5
1					
2	.28				
3	.09	.90**			
4	.04	.87**	.85**		
5	-.07	.03	.09	-.03	
6	-.23	.29	.31	.34	.38*

*p < .05 (one-tailed test)
**p < .05 (two-tailed test)

Code No.	Variable
1	Reaction Time (RT)
2	Pretest Level (PTL)
3	HR during RT trials
4	HR after RT trials
5	Alertness (A)
6	Interest (I)

Table 10

Intercorrelations Using Heart Rate Minus Pretest Level Scores

N-C Condition

	1	2	3	4	5
1					
2	-.15				
3	-.05	-.67**			
4	-.05	-.66**	.93**		
5	.14	-.17	.05	.03	
6	-.20	-.32	.01	.07	.57*

NS-C Condition

	1	2	3	4	5
1					
2	.03				
3	-.13	-.45**			
4	.07	-.45**	.74**		
5	.05	-.36	-.10	-.16	
6	-.15	-.40	-.05	-.21	.28

S-C Condition

	1	2	3	4	5
1					
2	.28				
3	-.41	-.18			
4	-.49**	-.41	.38		
5	-.07	.03	.13	-.11	
6	-.23	.29	.04	.03	.38*

*p $\leq$ .05 (one-tailed test)
**p $<$ .05 (two-tailed test)

Code No.	Variable
1	Reaction Time (RT)
2	Pretest Level (PTL)
3	HR-PTL during RT trials
4	HR-PTL after RT trials
5	Alertness (A)
6	Interest (I)

Discussion

Results obtained from the planned analyses provided no information regarding differences between a noncompetitive, a nonsocial and a social competitive situation. Although it is possible that differences between conditions do not exist, other factors may be responsible for the lack of findings.

In the present study, Ss were randomly assigned to each condition. Since Church (1962) found differences in RT between S-C and N-C with a repeated measurements design, it is possible that using different Ss in different conditions, in the present study, may have allowed individual differences in RT to obscure condition differences in RT.

Individual differences in HR may also have obscured condition differences in HR. In an attempt to examine this possibility, a baseline (PTL) was subtracted from HR scores. These resultant scores were analyzed and the data yielded a significant difference between competition and noncompetition. Only minimal evidence was available regarding the predicted difference between NS-C and S-C. While a significant difference between NS-C and S-C was not obtained, the direction of the condition means, for the data collected during the RT trials, suggested that Ss in the NS-C condition were less activated than Ss in the S-C condition.

Caution should be exercised regarding the suitability of the baseline (PTL). The HRs used as a PTL were taken after instructions had been read. An anlysis of variance of these PTLs yielded

significant differences between conditions. The question as to whether these differences were caused by instructions or whether they were a sampling artifact, needs further empirical study.

No significant differences in alertness were found. This lack of finding is at variance with Church's results (1962) which indicated that Ss were more alert during S-C as compared to N-C. Again the difference in findings between Church's study and this study can be attributed to the fact that Church used the same Ss in both conditions. The Ss could rate their level of alertness in one condition relative to their level of alertness in the other condition. In the present study the ratings of alertness between conditions were not relative to one another, a possible reason for the absence of significant differences.

Results indicated that Ss were more interested in competing with an instrument than with another person, probably because of the novelty of doing so (Berlyne, 1960). Competing with another person, a more common occurrence, was more interesting than doing a task alone and getting no feedback as to how one was doing. This finding seems divorced from the purposes of this thesis.

In view of the lack of significant differences between conditions for RTs, HRs and ratings of A, the lack of significant correlations among these variables is not surprising. Church (1962) who used RT as a measure of performance and level of palmar skin conductance as a measure of activation, and Elliot (1965) who used RT as a measure of performance and HR as a measure of

activation, also failed to find a relationship between activation and performance. They suggested that there may not be a relationship between activation and performance. This suggestion seems unwarranted in view of the fact that they only used one measure of activation and one measure of performance. It has been suggested (Duffy, 1962; Lacey and Lacey, 1958; Schnore, 1959) that one measure may not be enough to obtain an accurate indication of the level of activation. It may be that activation and performance on a RT task are related but multiple measures of activation are needed to expose the relationship. Consideration of the performance measure may be relevant. Perhaps there is no relationship between activation and simple tasks such as that involved in RT experiments. This does not rule out the possibility of a relationship between activation and performances of a more complex nature than the RT task. It may be that the level of activation is important only to tasks that involve more action and/or cognitive activity than the RT task. Work on the possible relationships between activation and performance is still needed. Thus, if multiple measures of activation and a more complex task had been utilized in the present experiment, a relationship between performance and motivation may have been revealed.

The results of the present study also failed to indicate any relationship between cognitive activity and performance, which is consistent with Church's findings (1962). This may have been due to the simplicity of the task. The level of cognitive activity

during the RT task may be too minimal. If a more complex task had been utilized a relationship between performance and cognitive activity may have been revealed.

In summary, this thesis has provided only a hint about a possible difference between social and nonsocial competition. The HR-PTL data collected during the RT trials suggested a lower level of activation for Ss in a nonsocial compared to a social competitive situation.

Suggestions for Future Research

This thesis was an exploratory study. It is possible that the design or method in this study was not adequate. A simple randomized groups design was employed. No attempt was initially made to control for individual differences in RT or HR as has been done in other studies (Church, 1962; Elliot, 1965; Harleston, Smith and Arey, 1965). Using different Ss in different conditions is probably the more precautionary method (no possibility of carry-over effects) of doing research in the area of competition. But, the problem of initial differences in measures used to indicate the level of performance and activation is present. The following suggestions are advocated for future research.

Exploration of the possible differences in activation between Ss in different conditions by using HR minus a PTL seems warranted. When the PTL should be taken as representative of baseline HR must be assessed in subsequent studies. If it is taken after instructions, the instructions might affect the PTL. If the PTL is taken before instructions, Ss might be so awesome and anxious about what is going to happen, that their HR might not be an acceptable PTL. Perhaps the best solution would be to give a neutral set of instructions, then record physiological responses, then give a differential set of instructions and again record physiological responses.

Exploring the possibility of detecting differences in performance between different Ss in different experimental conditions, by obtaining a PTL for RT, also seems desirable. That is, an average RT score should be obtained before instructions and task designed to induce motivation are administered. This PTL can be subtracted from RTs obtained during experimental conditions. These scores may reduce variance due to individual differences.

Another matter that should be investigated concerns the possible relationship between activation and performance. As indicated before, the failure to find a relationship between activation and performance in this study and others (Church, 1962; Elliot, 1965) may be due to the simplicity of the RT task. Perhaps if more complex tasks than those involved in RT experiments were utilized, relationships between activation and performance would be revealed.

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A P P E N D I C E S

APPENDIX A

RATING SCALES FOR ALERTNESS AND INTEREST

Please estimate your level of alertness during the trials		Please estimate your level of interest during the trials	
_____	1 Weak	_____	1 Weak
_____	2	_____	2
_____	3	_____	3
_____	4 Moderate	_____	4 Moderate
_____	5	_____	5
_____	6	_____	6
_____	7 Strong	_____	7 Strong

APPENDIX B

QUESTIONNAIRE ABOUT THE INSTRUMENT

Please answer these questions about the instrument.

1. Do you think it is efficient enough to be useful?
   Further comment?

2. Have you any idea on what principle it works?
   If so, explain.

3. How much less than an elaborate, faster, electronic instrument, do you think this instrument would cost?

APPENDIX C

INSTRUCTIONS

NO COMPETITION INSTRUCTIONS

This is a reaction time experiment. We wish to establish base levels for reaction time and heart rate for men your age. You are simply to sit here and when you hear the ready buzzer you depress the telegraph key and watch the light. As soon as the light comes on, release the key. Releasing the key breaks a circuit and stops a timer. Please try to do this as fast as you possibly can. You will sit here and relax for 3 minutes and then we will have 10 practice trials, and then I'll come back and make sure everything is alright and that you understand what you are to do.

NONSOCIAL COMPETITION INSTRUCTIONS

This is a reaction time experiment. We want to see how efficient you are and how you are affected physiologically when competing with this instrument. The instrument is a cheaply made instrument, made by an engineering graduate student, which unlike more expensive and elaborate instruments, varies in efficiency and cannout out-perform a human every time. We are also interested in testing the efficiency of the instrument. You are simply to sit here and when you hear the ready buzzer you depress the telegraph key. Releasing the key breaks a circuit and stops a timer. The instrument can also break a circuit when the light activates it. Your job is to try to beat the instrument. The winner will be announced by the buzzer using the code on the card. You will sit here and relax for 3 minutes and then we will have 10 practice trials, and then I'll come back and make sure everything is alright and that you understand what you are to do.

SOCIAL COMPETITION INSTRUCTIONS

This is a reaction time experiment. We want to see how efficient you are and how you are affected physiologically when competing with one another. You are simply to sit here and when you hear the ready buzzer you depress the telegraph key and watch the light. As soon as the light comes on release the key. Releasing the key breaks circuits and stops timers. Your job is to try and beat your opponent. The winner will be announced by the buzzer using the code on the card. You will sit here and relax for 3 minutes and then we will have 10 practice trials, and then I'll come back and make sure everything is alright and that you understand what you are to do. Under no circumstances are you to talk to one another before the experiment is over.